

a laboratory for cell biology. Hence, it is important to understand the transformation in this laboratory. Other laboratories, ones initially more explicitly devoted to cell physiology, also made significant contributions. At appropriate points in the chapter I will briefly profile three of them. It was the laboratory at the Rockefeller Institute, though, that established the model for what cell biology was and how it was done, and that will be the main focus of this chapter.

1. FIRST STEPS TOWARD CELL BIOLOGY AT THE ROCKEFELLER INSTITUTE: CLAUDE'S INTRODUCTION OF CELL FRACTIONATION

The pioneering investigations in cell biology at the Rockefeller Institute occurred in the cancer laboratory of James Murphy. Murphy was pursuing a line of research that traced back to Peyton Rous, whom Simon Flexner, the first director, recruited to the Rockefeller Institute in 1909. Shortly after arriving at Rockefeller, Rous was presented with a chicken with a large lump on its leg. The lump turned out to be a tumor that Rous showed could be transmitted from one animal to another by inoculation either with small portions of the tumor or with a filtered extract that strained out all cancer cells. He concluded that the tumor was carried by what were then termed "viral agents," characterized only as infectious entities that were not bacterial in nature. Although the tumor was to bear his name, Rous had been a reluctant recruit to cancer research and in 1915 turned instead to research on blood preservation (Corner, 1964).

With the change in direction of Rous' research, Murphy, who had been Rous' assistant, was promoted to associate member of the Institute and placed in charge of cancer research. (He became a full member in 1923.) For a number of years, his primary focus was on the possible role of lymphocytes in resisting cancer (an inquiry rooted in an observation he and Rous had made that embryos and brain tissue, both lacking lymphocytes, lacked resistance to transplanted tumor cells). By the late 1920s, though, Murphy turned his attention back to the agent responsible for Rous chicken sarcoma. Rous had shown not only that the suspected causal agent was found in cell-free extract but also that tumor cells could be killed with ultraviolet light without destroying the agent, which suggested to Murphy that the Rous chicken tumor agent might not be bacterial but rather have an "enzyme-like nature" (Murphy, Helmer, & Sturm, 1928). He had also determined while working under Rous that freezing and drying the tissue (a process known as lyophilization) did